R18 Regulation *Subject code:2P4CA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech IV Semester Regular/Supplementary Examinations, July 2021

DYNAMICS OF MACHINERY

(MECHANICAL ENGINEERING)

Maximum Marks: 70 Date:13.07.2021 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10x2M=20 Marks)

1 What is the effect of gyroscopic couple on ships and explain the terms pitching and rolling.
2 Explain the static and dynamic force analysis.
3 Define the term coefficient of fluctuation of energy.
4 Explain the term maximum fluctuation of energy in flywheel.
5 Distinguish between brakes and dynamometers.
6 What is principle of clutches, list out different types of clutches?
7 What is the function of Governor?
8 What is meant by Unbalanced forces and couples?
9 What are the various types of damping?
10 What is critical speed of shaft?

Part-B

Answer All the following questions. (5X10M=50Marks)

11 The length of connecting rod of a gas engine is 600 mm, and its C.G. lies at 165 mm from the crank pin center. The rod has a mass of 80 kg and a radius of gyration of 180 mm about an axis passing through the centre of the mass. The stroke of piston is 225 mm, and the crank speed is 300 rpm. Determine the inertia force on the crankshaft when the crank has turned through 125^0 from the inner dead centre. (10M)

OR

12 How do the effects of gyroscopic couple and of the centrifugal force make the rider of a two -wheeler to tilt on one side? Derive a relation for the limiting speed of the vehicle. (10M)

13 Draw the turning moment diagrams for the following engines neglecting the effect of inertia of the connecting rod: (10M)
a) Four stroke I.C Engine.
b) Multi-cylinder Engine.

OR

14 In a turning moment diagram, the areas above and below the mean torque line taken in order are 4400, 1150, 1300, and 4550mm^2 respectively. The scales of the turning moment diagram are : Turning moment : 1 mm = 100 N – m ; Crank angle:1mm 10 . Find the mass of the flywheel required to keep the speed between 297 and 303 rpm, if the radius of the gyration is 0.525m. (10M)

15 With a neat sketch, describe the principle and working of an internal expanding shoe – brake. Derive the expression for the force exerted (a) on the leading shoe, (b) on the trailing shoe. (10M)

OR

16 (a) Describe a single plate clutch with a neat diagram. (5M)
(b) State the laws of static and dynamic friction. (5M)

17 Derive the expression for Torque in clutch and also explain it's types. (10M)

OR

18 The lengths of the upper and lower arms of a Porter governor are 200 mm and 250 mm respectively. Both the arms are pivoted on the axis of the rotation. The central load is 150 N, the weight of each ball is 20 N and the friction of the sleeve together with the resistance of the operating gear is equivalent to a force of 30N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 300 and 400. Determine the range of the speed of the governor. (10M)

19 Explain about dunkerly's method. (10M)

OR

20 Find the frequency of transverse vibrations of a shaft which is simply supported at the ends and is of 40 mm in diameter. The length of the shaft is 5 m. The shaft carries three point loads of masses 15 kg, 35 kg and 22.5 kg at 1 m, 2 m and 3.4 m respectively from the left support. The Young's modulus for the material of the shaft is 220 GN/m^2 . The weight of the shaft is 18.394 N per meter length. (10M)